Pro'sKit®

MT-3109
AC/DC Digital Clamp Multimeter

CE

User's Manual

1st Edition, 2011

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MT-3109 AC/DC Digital Clamp Multimeter

Overview

This Operating Manual covers information on safety and cautions. Please read the relevant information carefully and observe all the Warnings and Notes strictly.

⚠ Warning

To avoid electric shock or personal injury, read the “Safety Information" and "Rules for Safe Operation" carefully before using the meter. Digital Clamp Multimeter Model (hereafter referred to as "the Meter") is 3 3/4 digits with steady operations, fashionable structure and highly reliable measuring instrument. The Meter uses large scale of integrated circuit with double integrated A/D converter as its core and has full range overload protection

The Meter can not only measure AC/DC Voltage, AC/DC Current, Frequency, Duty Cycle, Resistance, Diodes, Continuity but also it has Data Hold, Sleep Mode and Relative Mode features.

Unpacking Inspection

Open the package case and take out the Meter. Check the following items carefully to see any missing or damaged part:

Item	Description	Qty
1	User’s manual	1 piece
2	Test Lead	1 pair
3	Test Clip	1 pair
4	Carrying Bag	1 piece

In the event you find any missing or damage, please contact your dealer immediately.

Safety Information

This Meter complies with the standards IEC61010: overvoltage category (CAT.II 600V) and double insulation.

CAT. II: Local level, appliance, PORTABLE EQUIPMENT etc., with smaller transient over voltages than CAT.III

CAT. III: Distribution level, fixed installation, with smaller transient over voltages than CAT. IV

Use the Meter only as specified in this operating manual, otherwise the protection provided by the Meter may be impaired. In this manual, a Warning identifies conditions and actions that pose hazards to the user, or may damage the Meter or the equipment under test. A Note identifies the information that user should pay attention to International electrical symbols used on the Meter and in this Operating Manual are explained on page

Rules for Safe Operation

⚠ Warning

To avoid possible electric shock or personal injury, and to avoid possible damage to the Meter or to the equipment under test, adhere to the following rules:

- Before using the Meter inspect the case. Do not use the Meter if it is damaged or the case (or part of the case) is removed. Look for cracks or missing plastic. Pay attention to the insulation around the connectors.
- Inspect the test leads for damaged insulation or exposed metal. Check the test leads for continuity. Replace damaged test leads with identical model number or electrical specifications before using the Meter.
- Do not apply more than the rated voltage, as marked on the Meter, between the terminals or between any terminal and grounding If the value to be measured is unknown, use the maximum measurement position and reduce the range step by step until a satisfactory reading is obtained
- When measurement has been completed, disconnect the connection between
- The test leads and the circuit under test, remove the testing leads away from the input terminals of the Meter and turn the Meter power off.

- The rotary switch should be placed in the right position and no any changeover of range shall be made during measurement is conducted to prevent damage of the Meter.

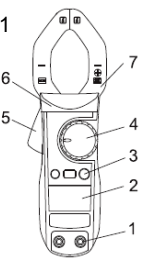
- Do not carry out the measurement when the Meter's back case and battery compartment are not closed to avoid electric shock.
- Do not input higher than 600V between the two Meter's input terminal to avoid electric shock and damages to the Meter.
- When the Meter working at an effective voltage over 60V in DC or 30V rms in AC, special care should be taken for there is danger of electric shock.
- Use the proper terminals, function, and range for your measurements.
- Do not use or store the Meter in an environment of high temperature, humidity, explosive, inflammable and strong magnetic field. The performance of the Meter may deteriorate after dampened.
- When using the test leads, keep your fingers behind the finger guards.
- Disconnect circuit power and discharge all high-voltage capacitors before testing resistance, continuity and diode.
- Replace the battery as soon as the battery indicator appears. With a low battery, the Meter might produce false readings that can lead to electric shock and personal injury.
- When servicing the Meter, use only the same model number or identical electrical specifications replacement parts.
- When servicing the Meter, use only the same model number or identical electrical specifications replacement parts.
- The internal circuit of the Meter shall not be altered at will to avoid damage of the Meter and any accident.
- Soft cloth and mild detergent should be used to clean the surface of the Meter when servicing. No abrasive and solvent should be used to prevent the surface of the Meter from corrosion, damage and accident.
- The Meter is suitable for indoor use.
- Turn the Meter off when it is not in use and take out the battery when not using for a long time.
- Constantly check the battery as it may leak when it has been using for some time, Replace the battery as soon as leaking appears. A leaking battery will damage the Meter.

International Electrical Symbols

~	AC (Alternating Current)
⎓	DC (Direct Current)
≂	AC or DC
⏚	Grounding
⧈	Double Insulated
⚠	Warning. Refer to the Operating Manual
⊟	Deficiency of Built-In Battery
•))	Continuity Test
⊣◁	Diode
⊣(	Capacitance Test
▭	Fuse
CE	Conforms to Standards of European Union

The Meter Structure (see figure 1)

figure.1



1. Input Terminals
2. LCD Display
3. Functional Buttons
4. Rotary Switch
5. Trigger: press the lever to open the transformer jaw
6. Hand Guards: to protect user's hand from touching the dangerous area.
7. Transformer Jaw: designed to pick up the AC and DC current flowing through the conductor. It could transfer current to voltage. The tested conductor must vertically go through the Jaw center.

Rotary Switch

Below table indicated for information of rotary switch positions.

Rotary Switch Position	**Function**
OFF	Power is turned off
V ≂	AC or DC voltage measurement
Ω	Resistance measurement
⊣⊢/ •ıı)	⊣⊢ : Diode test •ıı) : Continuity test
Hz / Duty %	Frequency Measurement and Duty Measurement
⊣(	Capacitance test range from 40.OOnF to 1OO.OuF
40A ≂ & 400A ≂	AC and DC current measurement range

Functional Buttons

Below table for information of functional button operations.

Button	Operation Performed
HOLD	● Press **HOLD** to enter the Hold mode in any mode, the Meter beeps. ● Press **HOLD** again to exit the Hold mode, the Meter beeps.
ELA	**At V≂ and Ω range:** •Press select manual ranging measurement mode. The Meter is default to auto ranging measurement mode. •When the Meter is at manual ranging measurement mode, press to step down the range. **At A≂ range:** •Press enter to the REL mode. It subtracts a stored value from the present measurement value and displays a result. **At Hz/Duty% range:** Press switch to between Hz measurement mode and Duty % measurement mode.

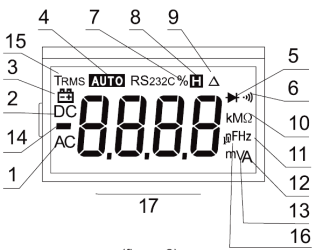
Button	Operation Performed
Select	•Press SELECT button to select the alternate functions marked in blue color on the Meter's faceplate including Hz, Duty%, V≂, ⊣+ •))), 40 A≂, and 400 A≂ . •After the Meter entering Sleep Mode, press and hold SELECT to turn the Meter on, it will disable the Sleep Mode feature.

The Effectiveness of Functional Buttons

Not every functional buttons can be used on every rotary switch positions. Below table describe which functional buttons can be used on which rotary switch positions

Rotary Switch Positions	Functional Buttons		
	SELECT	RELA	HOLD
V≂	●	●	●
Ω	N/A	●	●
⊣+/ •)))	●	N/A	●
Hz / Duty%	N/A	●	●
40 A≂	●	●	●
400 A≂	●	●	●
⊣+	N/A	●	●

Display Symbols (see figure 2)



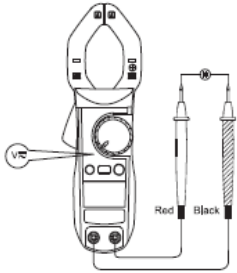
(figure 2)

MT-3109 AC/DC Digital Clamp Multimeter

No.	Symbol	Meaning
1	AC	Indicator for AC voltage or current
2	DC	Indicator for DC voltage
3		The battery is low. Warning: To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator appears.
4	AUTO	The Meter is in the auto range mode in which the Meter automatically selects the range with the best resolution.
5		Test of diode
6		The continuity buzzer is on
7	%	Indicator for Duty.
8	H	Data hold is active
9		Indicator for REL mode
10	**Ω,KΩ, MΩ**	Ω: Ohm. The unit of resistance. kΩ: Kilohm. $1x10^3$ or 1000 ohms MΩ: Megohm. $1x10^6$ or 1,000,000 ohms
11	**Hz**	The unit of Frequency
12	**A**	Amperes (amps). The unit of current.
13	**mV, V**	Volts. The unit of voltage. mV: Millivolt. $1xl0^{-3}$ or 0.001 volts
14		Indicates negative reading
15	**TRMS**	Indicator for TRMS mode
16	**F,nF,uF,**	Farad. The unit of capacitance.
17	**OL**	The input value is too large for the selected range

Measurement Operation

A. DC/AC Voltage Measurement (see figure 3)



(figure 3)

⚠ Warning

To avoid harms to you or damages to the Meter from electric shock, do not attempt to measure voltages higher than 600V AC/DC, although readings may be obtained

The DC Voltage ranges are: 400mV, 4V, 40V, 400V and 600V.

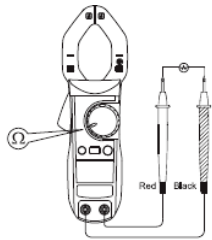
The AC Voltage ranges are: 4V, 40V, 400V and 600V.

To measure DC voltage, connect the Meter as follows:

(1) Insert the red test lead into the Hz Duty% terminal and the black test lead into the COM terminal.
(2) Set the rotary switch to V≂. DC measurement mode and auto ranging is a default.
(3) Press SELECT to switch to AC measurement mode or press REL△ to switch to manual ranging measurement mode.
(4) Connect the test leads across with the object being measured. The measured value shows on the display.

Note

A. When DC/AC voltage measurement has been completed, disconnect the connection between the testing leads and the circuit under test and remove testing leads from the input terminals.
B. Measuring Resistance (see figure 4)



(figure 4)

⚠ Warning

To avoid damages to the Meter or to the devices under test, disconnect circuit power and discharge all the high-voltage capacitors before measuring resistance.

The resistance ranges are:
400Ω, 4kΩ, 40kΩ,400kΩ,4 MΩ and 40MΩ.
To measure resistance, connect the Meter as follows:

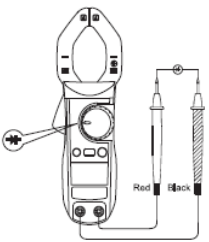
1. Insert the red test lead into the Hz Duty% terminal and the black test lead into the COM terminal.
2. Set the rotary switch to Ω. Resistance measurement is default to auto range mode, press RELA to switch to manual ranging measurement mode.
3. Connect the test leads across with the object being measured. The measured value shows on the display.

Note
- To obtain a more precise reading, you could remove the objects being tested from the circuit when measuring,
- When resistance measurement has been completed, disconnect the connection between the testing leads and the circuit under test and remove testing leads from the input terminals.

C. Testing Diodes (see figure 5)

⚠ Warning

To avoid damages to the Meter or to the devices under test, disconnect circuit power and discharge all the high-voltage capacitors before testing diodes.



(figure 5)

Use the diode test to check diodes, transistors, and other semiconductor devices. The diode test sends a current through the semiconductor junction, then measure the

voltage drop across the junction. A good silicon junction drops between 0.5V and 0.8V.

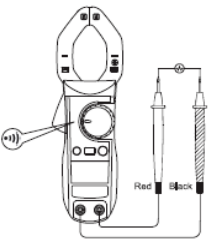
To test the diode out of a circuit, connect the Meter as follows:

1. Insert the red test lead into the Hz Duty% -i))-H VQ terminal and the black test lead into the COM terminal.
2. Set the rotary switch to →+ •)). Diode measurement mode is a default or presses SELECT to select →+ measurement mode.
3. For forward voltage drop readings on any semiconductor component, place the red test lead on the component's anode and place the black test lead on the component's cathode.

Note

- To obtain a more precise reading, you could remove the objects being tested from the circuit when measuring.
- When diode testing has been completed, disconnect the connection between the testing leads and the circuit under test and remove testing leads from the input terminals.

D. Testing for Continuity (see figure 6)



(figure 6)

⚠ Warning

To avoid damages to the Meter or to the devices under test, disconnect circuit power and discharge all the high-voltage capacitors before measuring continuity.

To test for continuity, connect the Meter as follows:

1. Insert the red test lead into the Hz Duty% •)) →+ VΩ terminal and the black test lead into the COM terminal.
2. Set the rotary switch to →+ •)) and press SELECT button to select •)) measurement mode. The buzzer sounds if the resistance of a circuit under test is less than 50Ω

3. The buzzer may or may not sounds if the resistance of a circuit under test is between 50Ω to 100Ω
4. The buzzer does not sound if the resistance of a circuit under test is higher than 100Ω

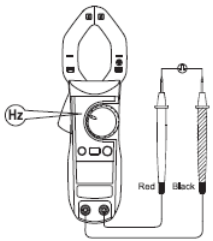
Note

- When continuity testing has been completed, disconnect the connection between the testing leads and the circuit under test and remove testing leads from the input terminals.

E. Frequency Measurement (see figure 7)

⚠ Warning

To avoid harms to you or damages to the Meter from electric shock, do not attempt to measure voltages higher than 600V AC/DC, although readings may be obtained.



(figure 7)

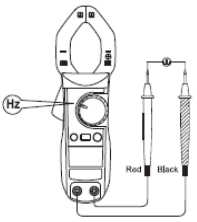
The resistance ranges are:
10Hz, 100Hz, 1kHz, 10kHz,
100kHz, 1MHz and 10MHz.
To measure frequency, connect the Meter as follows:

1. Insert the red temperature probe into the Hz Duty% terminal and the black temperature probe into the COM terminal.
2. Set the rotary switch to Hz.
3. Connect the test leads across with the object being test. The measured value shows on the display.

Note

- When frequency measurement has been completed, disconnect the connection between testing leads and the circuit under test, and remove testing leads away from the input terminals.

F. Duty Cycle Measurement (see figure 8)



(figure 8)

⚠ Warning

To avoid harms to you or damages to the Meter from electric shock, do not attempt to measure voltages higher than 600V AC/DC, although reading may be obtained.

The duty cycle range is: 0.1% ~99.9%.

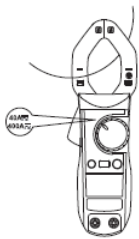
To measure duty cycle, connect the Meter as follows:

1. Insert the red temperature probe into the Hz Duty% terminal and the black temperature probe into the COM terminal.
2. Set the rotary switch to Hz and press RELA to select Duty Cycle measurement mode.
3. Connect the test leads across with the object being measured. The measured value shows on the display.

Note

- When duty cycle measurement has been completed, disconnect the connection between the testing leads and the circuit under test, and remove the testing leads away from the input terminals of the Meter.

G DC/AC Current Measurement (see figure 9)


(figure 9)

The measurement ranges of current are: 40.00 A≂ and 400.0 A≂

To measure current, do the following:

1. Set the rotary switch to 40 A≂ or 400 A≂. DC measurement mode is a default. Presses SELECT to switch between DC and AC measurement mode.
2. Hold the Meter tight, don't release. The Hall components are very sensitive not only to the magnet but also to heat and machines reaction force. Any shock will cause the changing in reading in the short time.

3. Press the lever to open the transformer jaw.
4. Center the conductor within the transformer jaw, then release the Meter slowly until the transformer jaw is completely closed, Make sure the conductor to be tested is placed at the center of the transformer jaw, otherwise it will cause deviation. The Meter can only measure one conductor at a time, to measure more than one conductor at a time will cause deviation.

Note

- Press RELA to subtracts a stored value from the present measurement value and displays a result.
- When current measurement has been completed, disconnect the connection between the conductor under test and the jaw, and remove the conductor away from the transformer jaw of the Meter.

Sleep Mode

To preserve battery life, the Meter automatically turns off if you do not turn the rotary switch or press any button for around 15 minutes.

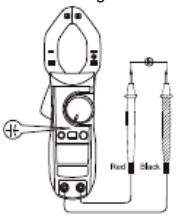
The Meter can be activated by turning the rotary switch or pressing the button based on 'The Effectiveness of Functional Buttons" on page 14. Press SELECT to activate the Meter will disable the Sleep Mode feature.

The Meter beeps 5 times in about 1 minute before entering Sleep Mode and it will have a 1 long beep just before entering Sleep Mode.

To disable the Sleep Mode function, press and hold SELECT button while turning on the Meter.

H. Capacitance measurement (see figure 10)

figure 10



⚠ Warming

To avoid damage to the Meter or to the equipment under test, disconnect circuit power and discharge all high-voltage capacitors before measuring capacitance. Use the DC voltage function to confirm that the capacitor is discharged.

The Meter's capacitance ranges arc: 40.00nF. 400.0nF, 4.000uF, 40.00uF, and 100.0μF. To measure capacitance, connect the Meter as follows:

1. Insert the red test lead into the HzV Ω terminal and the black test lead into the COM terminal.
2. Set the rotary switch to ⊣⊢.
3. Connect the test leads across with the object being measured. The measured value shows on the display.

Note

- For testing the capacitor with polarity, connect the red clip to anode & black clip to cathode instead of using test leads as mentioned above.
- To minimize the effect of capacitance stored in the test leads, the test lead should be as short as possible. To measure a small value of capacitance, use REL mode to remove the leads capacitance. Remaining voltage, insulated impedance & dielectric absorption from the capacitor may cause the measurement error.
- It takes a longer time when testing a high capacitor value, the testing time is around 15 seconds in 100uF range.
- The LCD displays OL indicating the tested capacitor is shorted or it exceeds the maximum range.
- When capacitance measurement has been completed, disconnect the connection between the testing leads and the circuit under test and remove the testing leads away from the input terminals of the Meter.

Specifications

A. General Specifications:

- Maximum Voltage between any Terminals and grounding: Refer to different range input protection voltage.
- Display: 3 3/4 digits LCD display, Maximum display 3999
- Polarity: Automatically display.
- Overloading: Display OL or -OL
- Battery Deficiency: Display
- Measurement Speed: Updates 3 times/second.
- Measurement Deviation: The conductor being measured is not placed in the center of the jaw during AC/DC current measurement, it will cause extra +1 % deviation based on the stated accuracy.
- Max. Jaw Size: 30mm diameter.
- Projected Max. Current conductor size: 30mm diameter.
- Electro-Magnetic: When carrying out measurement near the electro-magnetic, it may cause unstable or wrong reading.
- Power: 3x1.5V battery (AAA) (not included)
- Battery Life: typically 150hours (alkaline battery)
- Sleep Mode (can be disabled)
- Dimensions (H x W x 1): 203mm x 68mm x 33mm
- Weight: Approximate 235g (battery included)

B. Environmental Requirements

- The Meter is suitable for indoor use.
- Altitude: Operating: 2000m
- Storage: 1OOOOm
- Safety/ Compliances: IEC 61010 CAT.II 600V over voltage and double insulation standard.
- Temperature and humidity:
  Operating: O℃~30℃(~ 85%R.H);
  30℃~40℃ (~ 75%R.H);
  40℃~50℃ (~ 45%R.H);
  Storage: -20℃~+60℃ (~ 85%R.H)

Accurate Specifications

Accuracy: +(a% reading + b digits).
Operating temperature: 23℃±5℃
Relative humidity: (85%R.H)
Temperature coefficient: 0.1x (specified accuracy)1℃

A. DC Voltage

Range	Resolution	Accuracy	Overload protection
400.0mV	0.1mV	+(1 %+3)	600V DC/AC
4.000V	1mV	+(1 %+1)	
40.00V	10mV		
400.0V	100mV		
600V	1V	+ (1 %+5)	

Remarks: Input impedance: 10MΩ

B_ AC Voltage

Range	Resolution	Accuracy	Overload protection
4.000V	1mV	+ (1.2%+5)	600V DC/AC
40.00V	10mV		
400.0V	100mV		
600V	1V	+(1 .5 %+5)	

Remarks:

- ●Input impedance: 10MΩ// less than 100pF
- ● Frequency response: 40Hz-400Hz.
- ● Change to AC: Change to AC by using average response method. Input sine wave, then adjust the reading until it is same as the effective value.

C. Resistance

Range	Resolution	Accuracy	Overload protection
400.0Ω	100mΩ	+(1.2%+5)	600Vp
4.000kΩ	1Ω	+(1 %+5)	
40.00kΩ	10Ω		
400.0kΩ	10Ω		
4.000MΩ	1kΩ	+(1.2%+5)	
40.00MΩ	10kΩ	+(1.5%+5)	

D. Diode Test

Range	Resolution	Accuracy	Overload protection
	1mV	Display forward voltage drop nearest value	600Vp

Remark: Open circuit voltage approximate 1.48V.

E. Continuity Test

Range	resolution	accuracy	Overload protection
	100mΩ	Around≤50Ω The buzzer beeps	600Vp

Remark:
Open circuit voltage approximate 0.45V.

- The buzzer may or may not beeps when the resistance of a circuit under test is between 50Ω~1OOΩ
- The buzzer will not beep when the resistance of a circuit under test is > 1OOQ.

F. Frequency

Range	Resolution	Accuracy	Overload protection
10Hz	0.00Hz	+(0.1 %+5)	600Vp
100Hz	0.01Hz		
1kHz	0.1Hz		
10kHz	1Hz		
100kHz	10Hz		
1MHz	100Hz		
10MHz	1kHz	reference only	

Remark:
Input Sensitivity as follows:
When ≤ 100kHz: ≥ 300mV rms;
When > 100kHz: ≥ 600mV rms
When > 1MHz: ≥ 800mV rms

G. Duty Cycle

Range	Resolution	Accuracy	Overload protection
0.1 % ~99.9%	0.1 %	reference only	600Vp

H. DC Current

Range	Resolution	Accuracy	Overload protection
40.00A	0.01A	+(2.5%+5)	400A DC/AC
400.0A	0.1A	+(2.5%+3)	

⚠ Warning

The operating temperature must be 0℃~40℃ when measuring current.

Remark:

- If the reading is positive, the current direction is from bottom to up. See figure 10, the front case face up while the bottom case face down. Hold the Meter tight, do now release. The hall components are very sensitive not only to the magnet but also to heat and machines reaction force. Any shock will cause the changing in reading in the short time. Follow the below procedure to measure current will be more precise:

- Hold the Meter tight and press the lever to open the transformer jaw. Center the conductor within the transformer jaws, then release the Meter slowly until the transformer jaw is completely closed. Make sure the conductor to be tested is placed at the center of the transformer jaw, otherwise it will cause +1 .0% deviation based on the stated accuracy.
- Remove the transformer jaw.
- Press RELA to display zero.
- Repeat the above 1. procedure.
- The obtained reading will be more precise.

I. AC Current

Range	Resolu -tion	Accuracy	Frequency Response	Overload protection
40.00A	0.01A	+(3%+8)	50Hz ~ 60Hz	400A DC/AC
400.0A	0.1A	+(3%+5)		

⚠ Warning

The operating temperature must be O℃ ~40℃ when measuring current.

Remark:

- It may have 10 digits or less unstable or wrong digits, it will not affect measurement result.
- Hold the Meter tight, do now release. The Hall components are very sensitive not only to the magnet but also to heat and machines reaction force. Any shock will cause the changing in reading in the short time. Follow the below procedure to measure current will be more precise:
  1. Hold the Meter tight and press the lever to open the transformer jaw. Center the conductor within the transformer jaws, then release the Meter slowly until the transformer jaw is completely closed. Make sure the conductor to be tested is placed at the center of the transformer jaw, otherwise it will cause +1.0% deviation based on the stated accuracy.
  2. Remove the transformer jaw.
  3. Press RELA to display zero.
  4. Repeat the above 1. procedure.
  5. The obtained reading will be more precise.

●Change to AC:
Change to AC by using average response method. Input sine wave, then adjust the reading until it is same as the effective value.

J. Capacitance

Range	Resolution	Accuracy	Overload Protection
40nF	10pF	Measure at REL mode ±(5 %+1 0)	600Vp
400nF	100pF	±(5%+1 0)	
4uF	1nF		
40uF	10nF		
100uF	100nF	±(6%+10)	

MAINTENANCE
This section provides basic maintenance information including battery replacement instruction.

⚠Warning
Do not attempt to repair or service your Meter unless you are qualified to do so and have the relevant calibration, performance test, and service information
To avoid electrical shock or damage to the Meter, do not get water inside the case.
A. General Service
- Periodically wipe the case with a damp cloth and mild detergent. Do not use abrasives or solvents.
- To clean the terminals with cotton bar with detergent, as dirt or moisture in the terminals can affect readings.
- Turn the Meter power off when it is not in use.
- Take out the battery when it is not using for a long time.
- Do not use or store the Meter in a place of humidity, high temperature, explosive, inflammable and strong magnetic field.

B. Replacing the Battery (see figure 11)

⚠ Warning

To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator "🔋" appears. Make sure the transformer jaw and the test leads are disconnected from the circuit being tested before opening the case bottom.

To replace the battery:

figure 11

1. Turn the Meter off and remove all the connections from the input terminals
2. Turn the Meter's front case down.
3. Remove the screw from the battery compartment, and separate the battery compartment from the case bottom
4. Take out the old battery and replace with a new 9V battery
5. Rejoin the case bottom and the battery compartment, and reinstall the screw.

** END **

This operating manual is subject to change without notice.

MT-3109 數位交直流鉗表 中文說明書

一、概述

MT-3109 是一種性能穩定、安全、可靠的 3 3/4 位交直流數字鉗形表（以下簡稱鉗表）系列。整機電路設計以大規模積體電路雙積分 A/D 轉換器爲核心，全量程的過載保護電路，獨特的外觀設計使之成爲性能優越的專用電工儀表。鉗表可用於測量交直流電壓、交直流電流、電阻、二極體、電路通斷及頻率等。本使用說明書包括有關的安全訊息和警告提示等，請仔細閱讀有關內容並嚴格遵守所有的警告和注意事項。

△警告!
在使用鉗表之前，請仔細閱讀有關“安全操作準則”

二、開箱檢查

打開包裝盒，取出儀表，請仔細檢查下列項目是否缺少或損壞：

項次	名稱	數量
1	使用說明書	1 本
2	表棒	1 組
3	帶夾短測試線	1 組
4	布包	1 個

如果發現任何一個項目缺少或損壞，請立即與您的供應商進行聯繫。

三、安全操作準則

請注意“警告標識△及警告字句”。警告表示對使用者構成危險、對儀表或被測設備可能造成損壞的情況或行動。

本儀表嚴格遵循 GB4793 電子測量儀器安全要求以及 IEC61010-1 和 IECI010-2-032 安全標準進行設計和生產，符合雙重絕緣、過電壓 CAT II 600V、CAT III 300V 和污染等

級 2 的安全標準。如果未能按照有關的操作說明使用鉗表，則可能會削弱或失去鉗表爲您提供的保護能力。

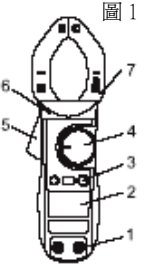
1．使用前應檢查鉗表和表筆，謹防任何損壞或不止常的現象。如發現本鉗表表筆、殼體絕緣已明顯損壞以及液晶顯示器等或者您認爲本鉗表已無法正常工作，請勿再使用本鉗表。
2．後蓋及電池蓋沒有蓋好前嚴禁使用鉗表，否則有電擊危險。
3．在進行測量時切記手指不要超過表筆擋手部位，不要接觸裸露的電線、連接器及沒有使用的輸入端或正在測量的電路防止觸電。
4．測量前功能開關必須置於正確位置，嚴禁在測量進行中轉換檔位，以防損壞鉗表。
5．不要在鉗表終端及接地之間施加 600V 以上電壓，以防電擊和損壞鉗表。
6．當儀表在 60V 直流電壓或是 30V 交流有效值電壓下工作時應小心操作，此時會有電擊的危險存在。
7．不要測量高於允許輸入值的電壓或電流，在不能確定被測量值的範圍時須將功能量程開關置於最大量程位置。進行線上電阻、二極體或電路通斷測量之前，必須先將電路中所有電源切斷，並將所有電容器放電。測量完畢要斷開表筆與被測電路的連接，並從鉗表輸入端拿掉表筆以及關斷鉗表電源。
8．當液晶顯示器顯示“ ⊏+ ”標誌時，應及時-更換電池，以確保測量精度。鉗表長期不用時，應取出電池。
9．請勿隨意改變鉗表內部接線，以免損壞儀表和危及安全。
10．　不要在高溫、高濕、易燃、易爆和強電磁場環境下存放或使用鉗表。
11．　維護保養請使用軟布及中性清潔劑清潔儀表外殼，切勿使用研磨劑及溶劑，以防外殼被腐蝕而損壞儀表危及安全。

四、電氣符號：

⧈	雙重絕緣
≂	AC（交流）
⊣⊢	二極體
⏚	接地
⎓	DC（直流）
⊟	表內電池不足
⚠	警告提示
·))	蜂鳴通斷
—	AC 或 DC（交流或直流）
ϟ	高壓符號
MC	中國技術監督局 製造計量器具許可證
CE	符合歐洲共同體（European Uion）標準
⊣⊢	電容測試

五、外表結構（見圖 1）

圖 1



1. 輸入端。
2. 液晶數字顯示。
3. 功能按鍵，選擇基本功能。
4. 測量功能轉盤。
5. 鉗頭板機：按壓板機， 使鉗頭張開，若鬆開板機，則鉗頭局部再度密合。
6. 手部防護：爲保護使用者手部碰碰觸到危險區的一種安全設計。
7. 鉗頭：爲測量交流電流的一種裝置，使電流轉換爲電壓，待測電流單一導體必須穿越鉗頭中心。

六、顯示符號（見圖 2）

1． 交流信號測量指示
2． 直流信號測量指示
3． 電池電量不足指示
4． 自動量程指示
5． 二極體測試指示
6． 連續檢測指示
7． 占空比測量指示
8． 數據保持指示
9． 相對值測量指示
10． 電阻測量單位（Ω 歐姆、kQ 千歐、MQ 兆歐）
11． 頻率測量單位
12． 電流測量單位（A 安培）
13． 電壓測量單位(mV 毫伏、V 伏特)
14． 負極性指示
15． 真有效值測量指示
16． 電容測量單位(F, nF, uF)
17． 對所選量程輸入信號太高，表示溢出

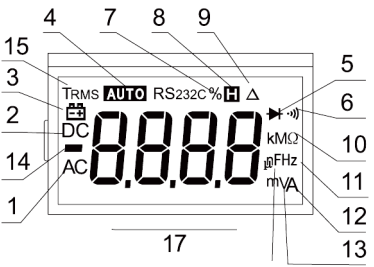


圖 2

七、按鍵功能及自動關機

1. HOLD:爲讀數保持鍵，以觸發模式工作，功能爲保持顯示讀數。按一次此鍵顯示值被鎖定，一直保持不變。再按一次此鍵，鎖定狀態被解除，返回通常測量狀態。
2. REL△：爲多功能組合鍵，以觸發模式工作。在 V 及Ω測量檔位時，作爲 RANGE 鍵使用，鉗表開機預設爲自動量程。按一下此鍵即切換爲手動量程。在手動量程狀態下，按一下此鍵即往上跳一檔，如果在最高檔位則跳至最低檔位。按住此鍵超過 2 秒鐘，即切換爲白動量程，在 A-測量檔位時，作爲 REL△鍵使用，按此鍵後使鉗表將當前顯示值作爲參考值，並將顯示“O”，在此之後的測量結果中將自動減去參考值，直到再按此鍵退出相對值測量功能，在 Hz 測量檔位時，作爲 Hz/Duty%鍵使用，按此鍵後，可以使鉗表再 H z 測量和 Duty%測量模式之間的切換。
3. SELECT:爲功能選擇鍵，以觸發方式工作，用此鍵可作爲 V、A、及 ⊣/•)) 測量檔時測量方式的切換。

注意：在自動關機後，若按著 SELECT 鍵開機，自動關機功能將被取消。

4. 自動關機：在測量過程中，功能按鍵和轉盤開關在 15 分鐘內均無動作時，鉗表會“自動關機”（休眠狀態），以節約電能; 要取消自動關機功能，只要按著 SELECT 鍵開機，則自動關機功能被取消。自動關機狀態下，按功能鍵（有效的按鍵操作，詳見 6．）或是轉動轉盤開關，鉗表會“自動開機”（工作狀態）。

注意：在休眠狀態下按 SELECT 鍵喚醒，自動關機功能被取消。

5. 蜂鳴器：在任一測量檔位按動任意功能按鍵，如果該鍵有效，蜂鳴器會發“嗶”的一聲，無效則不發聲; 自動關機前約 1 分鐘蜂鳴器會連續發出 5 聲警示; 關機前蜂鳴器會以 1 長聲警示。
6. 按鍵的有效性：並非所有的按鍵操作在任一檔位上都是有效的，只有有效的按鍵操作，才能選擇相應的操作功能或喚醒休眠狀態下的儀表，見下表：

檔位	SELECT	REL△	HOLD
V⎓	●	●	●
Ω	N/A	●	●
→|←/·))	●	N/A	●
Hz	N/A	●	●
40A⎓	●	●	●
400A⎓	●	●	●
⊣⊢	N/A	●	●

八、測量操作說明

警告：鉗表不得用於電壓大於 600V 交流／直流導電的物體上

1．直流電壓測量(V⎓)(見圖 3)

＊ 設定轉盤
將功能轉盤置於“V⎓”測量檔。
＊ 選擇按鍵功能
直流電壓測量爲最初設定值，最初 設定爲自動量程，按 REL△鍵設定爲手動量程。
＊ 連接負載
在完成所有的測量操作後，要斷開表棒與被測電路的連接，並從輸入端拿掉表棒。

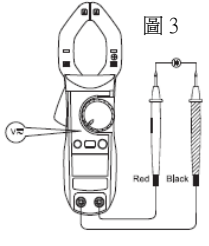


圖 3

2・交流電壓測量(V≂)（見圖 4）

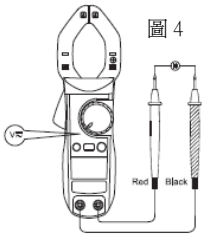


圖 4

△警告
鉗表不得用於電壓大於 600V 交流／直流導電的物體上
＊ 設置轉盤
將功能轉盤置於“V≂”測量檔。
＊ 選擇功能
按 SELECT 鍵選擇爲交流電壓測量，最初設置
爲自動量程，按 REL△鍵可設置爲手動量程。
＊ 連接負載
在完成所有的測量操作後，要斷開表棒與被測電路的連接，並從輸入端拿掉表棒。

3・電阻測量(Ω) (見圖 5)

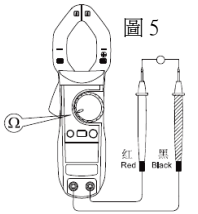


圖 5

△警告
在連接負載以前務必將電路電源切斷，並將所有電容器放盡殘餘電荷
＊ 設定轉盤
將功能轉盤置於“Ω”測量檔。
＊ 選擇功能
最初設定爲自動量程，按 REL△鍵可設定爲手動量程。
＊ 連接負載
若將元件從電路中分離出來測量可得到較好的結果。在完成所有的測量操作後，要斷開表棒與被測電路的連接，
並從輸入端拿掉表棒。

4・二極體測量(⇥) (見圖 6)

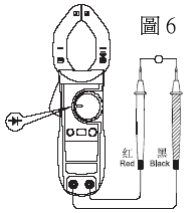


圖 6

△警告
在連接負載以前務必將電路電源切斷，並將所有電容器放盡殘餘電荷。
＊ 設置轉盤
將功能轉盤置於“⇥ ·))”測量檔。
＊ 選擇功能
⇥ 測量爲最初設定值。
＊ 連接負載
若將元件從電路中分離出來測量可得到

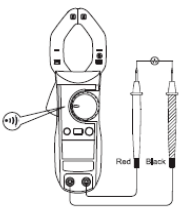
較好的結果。
在完成所有的測量操作後，要斷開表棒與被測電路的連接，並從輸入端拿掉表棒。

△警告：在連接負載以前務必將電路電源切斷

* 設置轉盤到 ⊣◀ 位置
* 選擇功能
  按 SLLECT 鍵選擇二極體測
* 連接負載
  若將元件從電路中分離出來測量可得到較好的結果。

5．導通檢測（ ·)) ）(見圖 7)

圖 7



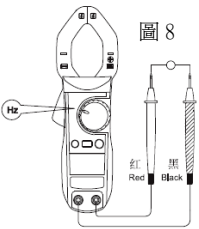
△警告
在連接負載以前務必將電路電源切斷，並將所有電容器放盡殘餘電荷

* 設定轉盤
  將功能轉盤置於 “ ⊣◀ ·)) ” 測量檔。
* 選擇功能
  按 SELECT 鍵選擇 ·)) 導通檢測
* 連接負載

在導通測試中測量電阻小於 50Ω時蜂鳴器會響，在 50Ω到 100Ω時蜂鳴器可能響或不響，大於 100Ω 時蜂鳴器不響。
在完成所有的測量操作後，要斷開表棒與被測電路的連接，並從輸入端拿掉表棒。

6．頻率測量(Hz)（見圖 8）

圖 8



△警告
鉗表不得用於電壓大於 600V 交流直流導電的物體上

* 設定轉盤
  將功能轉盤置丁 “Hz” 測量檔。
* 選擇功能
  Hz 頻率測量爲最初設定值。
* 連接負載

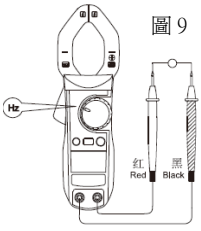
在完成所有的測量操作後，要斷開表棒與被測電路的連接，並從輸入端拿掉表棒。

7・占空比測量(Duty%)（見圖 9）

△警告
鉗表不得用於電壓大於 600V 交流/直流導電的物體上

* 設定轉盤
  將功能轉盤置於‘Hz”測量檔。
* 選擇功能
  按 REI△鍵可設定爲 Duty%占空比測最。
* 連接負載
  在完成所有的測最操作後，要斷開表筆與被測電路的連接，並從輸入端拿掉表筆。

圖 9

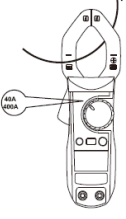


8・直流电流測量(A⎓) （見圖 10）

* 設定轉盤
  將功能轉盤置於“40A ≂”或“400A ≂”測量檔。
* 選擇功能
  直流電流測量爲最初設定值。
* 連接負載

按住板機不要突然鬆開，鉗頭內置的霍爾元件是一種敏感器件，除了對磁敏感外，對熱、機械應力均有不同程度的敏感，撞擊會短時間引起讀數變化。按住板機打開鉗頭，將鉗頭夾取待測導體，然後緩慢地放開板機，直到鉗頭完全閉合，請確定待測導體是否被夾取在鉗頭的中央，未置於鉗頭中心位置會產生附加誤差，鉗表一次只能測量一個電流導體，若同時測量兩個或以上的電流導體，測量讀數會是錯誤的。

圖 10

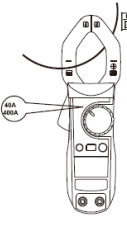


9・交流電流測量(A ≂) (見圖 11)

* 設定轉盤
  將功能轉盤置於“40A ≂ ”或“400A ≂”測量檔。
* 選擇功能
  按 SELECT 鍵選擇爲交流電流測量。
* 連接負載

按住板機不要突然鬆開，鉗頭內置的霍爾元件是一種敏感器件，除了對磁敏感外，

圖 11



對熱、機械應力均有不同程度的敏感，撞擊會短時間引起讀數變化。按住板機打開鉗頭，將鉗頭夾取待測導體，然後緩慢地放開板機，直到鉗頭完全閉合，請確定待測導體是否被夾取在鉗頭的中央，未置於鉗頭中心位置會產生附加誤差，鉗表一次只能測量一個電流導體，若同時測量兩個或以上的電流導體，測量讀數會是錯誤的。

10．電容測試(⊣⊢)（見圖 12）
將功能轉盤置於"⊣⊢"測量檔
將紅色表棒插入"HzV Ω"插孔，黑表棒插入"COM"插孔，並將表筆並聯到被測電容上．從顯示器上讀取測量結果

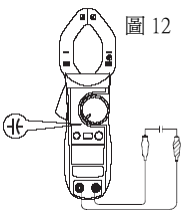


圖 12

九、技術指標

1．一般規格

- 液晶顯示：3 3/4 位液晶顯示，最大顯示至 3999.
- 極性顯示：自動正負極性顯示
- 過載顯示：以"OL"或"-OL"顯示
- 低電壓顯示：　"⊟+"　符號顯示電池電壓低於工作電壓，做爲更換電池的參考
- 取樣率：3 次／秒
- 傳感器種類：DC/AC 測量的霍爾效應傳感器
- 測試位置誤差：測量電流時因爲未將待測源置於鉗頭中心位置會產生±1.0%讀數附加誤差
- 鉗頭開啓最大尺寸：直徑 30mm
- 預測電流導線最大尺寸：直徑 30 mm
- 電磁場影響：使用於靠近電磁場產生的裝置，可能顯示不穩定或顯示不正確的讀數
- 電源需求：三個 AAAl.5V 電池(不含)
- 電池壽命：典型爲 150 小時（鹼性電池）
- 自動關機功能（可以在使用時取消該功能）
- 尺寸：68mm（寬）×203（長）×33 mm（高）
- 重量：約 220（不包括電池）

2・環境限制

室內使用
- 安規：ICE 1010-1 CAT. II600V
- 操作溫濕度：0℃到 30℃（不大於 80%R.H）
- 30℃到 40℃（不大於 75%R.H・）
- 40℃到 50℃（不大於 45%R.H・）
- 儲存溫濕度：-20℃到+60℃（不大於 80%R.H・）

3・電氣規格

- 準確度：±（%讀數+位數），校準期爲一年
- 環境溫度：23℃±5℃
- 環境濕度：小大於 80%R・H・
- 溫度系數：0.1×精度／1℃

(1)直流電壓(V⎓)

量程	分辨力	準確度	過載保護
400. 0 mV	0. 1 mV	±(1%+3)	600V DC/AC
4.000 V	1 mV	±(1%+1)	
40.00 V	10 mV		
400.0 V	100 mV		
600 V	1V	±(1%+5)	

輸入阻抗：10 M Ω

(2)交流電壓（V）

量程	分辨力	準確度	過載保護
4.000 V	1 mV	±(2%+5)	600V DC/AC
40.00 V	10 mV		
400.0 V	100 mV		
600 V	1V	±(1.5%+5)	

輸入阻抗：10M Ω//100pF
頻率附應：40Hz～400Hz

AC 轉換類型：
AC 轉換是用平均值附應模式，以正弦波輸入、校正讀數至與有效值一致。

(3)電阻(Ω)

量　程	分辨率	準確度	過載保護
400.0 Ω	100 mΩ	±(1.2%+5)	600Vp
4.000 KΩ	1Ω	±(1%+5)	
40.00 KΩ	10Ω		
400 KΩ	100Ω		
4.000 MΩ	1KΩ	±(1.2%+5)	
40.00 MΩ	10KΩ	±(1.5%+5)	

(4)二極體測試(⊣◀)

量程	分辨力	準確度	過載保護
⊣◀	1mV	顯示正向壓降近似值 (開路電壓約 1. 48V)	600Vp

(5)導通測試(·)))

量程	分辨力	準確度	過載保護
·))	100 m Ω	約≦500Ω 時蜂鳴器會響 (開路電壓約 0. 45V)	600Vp

注意：在導通測試中量測電阻在 50Ω ～100Ω 時蜂鳴器可能響或不響，>100Ω 時蜂鳴器不響。

(6)頻率(Hz)

量程	分辨力	準確度	過載保護
10 Hz	0. 001Hz	±(0.1%+5)	600Vp
100 Hz	0.01Hz		
1k Hz	0. 1Hz		
10k Hz	1Hz		
100k Hz	10Hz		
1M Hz	100Hz		
10M Hz	1kHz	(讀數僅供參考)	

靈敏度:≦100kHz 時:≧300mV rms;
>100kHz 時:≧600mV rms
>1MHz 時:≧800mV rms

(7)占空比(Duty%)

量程	分辨力	準確度	過載保護
0. 1%-99. 9%	0. 1%	（讀數僅供參考）	600Vp

(8)直流电流(A⎓)

量程	分辨力	準確度	過載保護
40. 00A	0.01A	±(2.5%+5)	400A DC/AC
400.0A	0.1A	±(2.5%+3)	

注意: 電流測量功能必須在 0℃～40℃之間操作。在直流電流測量時，如果讀數爲正值，則電流的方向爲由下到下（見圖 10:面板爲上，底蓋爲下）。
按住板機不要突然鬆開，鉗頭內置的霍爾元件是一種敏感器件，除了對磁敏感外，對熱、機械應力均有不同程度的敏感，撞擊會短時間引起讀數變化。

如下的操作方法將使 A⎓ 測量更加準確：
①按住板機打開鉗頭，將鉗頭夾取待測導體，然後緩慢地放開板機，直到鉗頭完全閉合，請確定待測導體是否被夾取在鉗頭的中央，未置於鉗頭中心位置會產生±1. 0%讀數附加誤差；
②將電流導體上的鉗頭移開；
③按 REL△鍵使顯示歸零；
④重複如上步驟 ；
⑤如此測量的結果將可得到更準確的 A⎓ 讀數。

(9)交流電流(A ≂)

量程	分辨力	準確度	頻率	過載保護
40. 00A	0.01A	±(2.5%+8)	50Hz～ 60Hz	400 DC/AC
400. 0A	0. 1A	±(2.5%+5)		

注意: 電流測量功能必須在 O℃- 40℃之間操作。
在交流電流檔位時，可能會顯示 1 0 個字以下不穩定的或不正確的感應讀數，不會影響測量結果。
按住板機不要突然鬆開，鉗頭內置的霍爾元件是一種敏感器件，除了對磁敏感外，對熱、機械應力均有不同程度的敏感，撞擊會短時間引起讀數變化。

AC 轉換類型：
AC 轉換是用平均值附應模式，以正弦波輸入、校正讀數至與有效值一致。

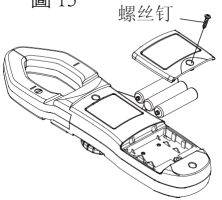
(10)電容值(⊣⊢)

量程	分辨力	準確度	過載保護
40nF	10pF	Measure at REL mode ±(5%+1 0)	600Vp
400nF	100pF	±(5%+1 0)	
4μF	1nF		
40μF	10nF		
100μF	100nF	±(60%+10)	

十、保養和維護（見圖 13）

警告：在打開底蓋前爲避免電擊，請移開測試棒。

圖 13



1.一般維護

a.本鉗表的維修與服務必須由有資格的專業維修人員或指定的維修部門完成。

b.定期性使用乾布去清潔外殼，但不得使用含有研磨妝或溶劑成份的清潔劑。

2.電池安裝或更換

本產品的電力爲三顆 1.5V　AAA 電池，按下列順序安裝或更換電池。

a.本產品關機，請移開位於輸入端之測試棒。

b.將本產品面板朝下，並旋開電池盒螺絲，拔下電池蓋。

c.從電池倉上取下舊電池，按照極性指示安裝新電池。

d.請使用同一型號的從 A 電池，不要安裝不適當的電池，新舊以及不同型號的電池不能混裝使用。

e.安裝新的電池後，裝上包池蓋，並鎖上螺絲即可。

寶工實業股份有限公司
PROKIT'S INDUSTRIES CO., LTD.
http://www.prokits.com.tw
E-mail : pk@mail.prokits.com.tw

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